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AN OUTLINE OF THE DEVELOPMENT OF THE BIVALVE GASTROPOD *MIDORIGAI AUSTRALIS* BURN, 1960

By B. WISELY, M.Sc.[*]

Figure 1.

Summary: Specimens of *Midorigai australis* collected in Port Hacking, Sydney, and measuring less than 1.0 mm. in shell length laid two egg masses in the laboratory. Each egg mass contained 50 ± 2 eggs which developed along typically gastropod lines to hatch on the 11-13th day. Paired statocysts, eyespots, and velar lobes were readily visible in the free swimming veliger. An operculum was present. The protoconch measured 116-118μ in diameter and was brownish and transparent, except for the straight, posterior edge of the opening. The latter was dark brown. Evidently the development of the paired valves and associated musculature takes place later in the life history.

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Account: During April, 1962, plankton tows were made through strapweed beds (*Posidonia* sp.) in Port Hacking. Two specimens of a bivalve gastropod were taken in one tow made on the bottom of the channel immediately north of the "Ballast Heap" on April 17. These specimens were set aside in a small dish of seawater containing a few strands of the green alga *Enteromorpha intestinalis.* During the next 24 hours one of them laid an egg mass. Three more slightly smaller specimens were collected at the same locality on April 18, and added to the dish. A second egg mass was found in it on April 24. This showed that some of the specimens were mature, even though the largest present was only 0.98 mm. in shell length. These specimens were sent, together with several others taken in Gunnamatta Bay, Port Hacking, to Mr. R. Burn for identification. Mr. Burn (pers. comm.) has provisionally identified the material as *Midorigai australis* Burn (1960), and is including descriptions of it in his current review of the Australian bivalve gastropods. Since the egg masses were viable, it was possible to make observations on their development. However, because of the risk of heat damage from the microscope lamp such observations were made only for brief, well-spaced intervals; and only an outline of the development was obtained.

The egg masses (fig. 1) contained 50 ± 2 eggs and were flattened, roughly circular, and 0.5-0.6 mm. in diameter. The eggs (fig. 2) were *c.* 54μ in diameter and white with a clear nuclear zone; each was contained in a tough, transparent, roughly spherical capsule. They had been laid on the *Enteromorpha* and adhered to it firmly. The first egg mass found had evidently been laid only recently because cleavage had not commenced, and the largest bivalve gastropod present (shell length 0.98 mm.) was crawling over its surface. It continued to do this for a further 15 minutes before crawling away. At room temperature (21°C) nearly half the eggs were at the two-cell stage (fig. 3) six hours later. By eight hours all stages up to and including the four-cell were present, but polar bodies were not observed. Several eggs were in the three-cell stage (fig. 4) but polar lobe formation or the transition to the four-cell stage (fig. 5) was not seen. After 24 hours most of the eggs had reached early blastula stages (figs. 6, 7) and by 70 hours rudimentary velar lobes were developing and the embryos were revolving within the egg capsules (fig. 8). During the next three days the velar lobes differentiated and their cilia became more numerous. On the seventh day the larvae were clearly young gastropods. Two black eyespots and two statocysts had appeared (fig. 9) and pigmented areas were present around the circumference of the larvae (fig. 10). This was followed by the appearance of the protoconch and operculum on the ninth and tenth day, but other details were obscured by a growth of algal filaments around the egg mass. The egg capsules within the egg mass now broke down and for a time the veligers swam freely within the large central cavity so formed. Hatching, which took place on the thirteenth day, was delayed by the algal filaments binding the periphery of the egg mass. The second egg mass was not found until its eggs were at the blastula stage; its development was similar, but the algal growth around it was not so well-developed and hatching commenced on the eleventh day.

In the veliger about to hatch (figs. 11, 12) the protoconch was shiny, transparent and brown. It was not a regular spiral but was longest in a plane passing through the dorsal edge of the opening, across the posterior edge of the latter, to the opposite side of the shell. Its diameter in this plane was 116-118μ. An operculum was present. The posterior edge of the protoconch opening stood out as a dark brown bar and the paired eyespots and statocysts were readily visible. Three lobes in the body were present in the positions shown, but further details were not seen as the veligers would not emerge when illuminated. The newly-hatched veligers were rapid swimmers and the majority of them soon swam into the surface film of the sea-water, to which they adhered. The attraction between the surface film and the apparently hydrophobic protoconch was too powerful for them to break by the action of their cilia and eventually nearly all of them became caught in the surface film and died.

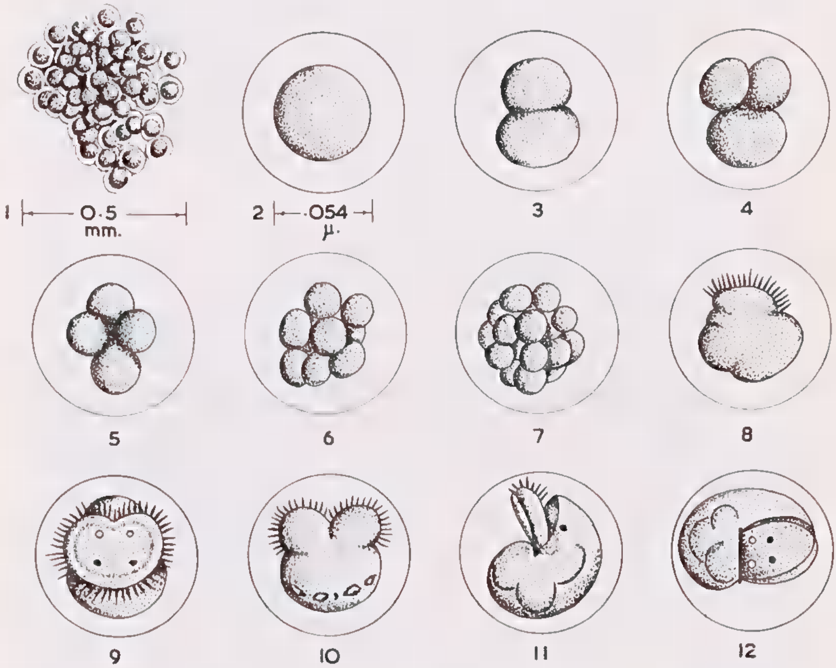

Figure 1.

Stages in the development of *Midorigai australis*.

(1) egg mass; (2) egg in capsule; (3) two-cell stage; (4) three-cell stage; (5) four-cell stage; (6) and (7) early blastulae; (8) early embryo developing velar lobes; (9) and (10) late embryo with statocysts, eyespots and pigmented areas developed; (11) and (12) veliger just before hatching with operculum and protoconch present.